



U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1697

Brigade Battle Staff Training System

Charles R. Andre'
BDM Federal, Inc.

Margaret S. Salter
U.S. Army Research Institute

DTIC QUALITY INSPECTED 4

19961101 008

June 1996

Approved for public release; distribution is unlimited.

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

**A Field Operating Agency Under the Jurisdiction
of the Deputy Chief of Staff for Personnel**

EDGAR M. JOHNSON
Director

Research accomplished under contract
for the Department of the Army

BDM Federal, Inc.

Technical review by

Michael McCluskey
Kathleen Quinkert

NOTICES

DISTRIBUTION: Primary distribution of this report has been made by ARI. Please address correspondence concerning distribution of reports to: U.S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-STP, 5001 Eisenhower Ave., Alexandria, Virginia 22333-5600.

FINAL DISPOSITION: This report may be destroyed when it is no longer needed. Please do not return it to the U.S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

REPORT DOCUMENTATION PAGE

1. REPORT DATE 1996, June			2. REPORT TYPE Final		3. DATES COVERED (from... to) August 1994-February 1996	
4. TITLE AND SUBTITLE Brigade Battle Staff Training System			5a. CONTRACT OR GRANT NUMBER MDA 903-92-D-0075-30			
			5b. PROGRAM ELEMENT NUMBER 06023007A			
6. AUTHOR(S) Charles R. Andre' (BDM Federal) and Margaret S. Salter (ARI)			5c. PROJECT NUMBER A794			
			5d. TASK NUMBER 2126			
			5e. WORK UNIT NUMBER C04			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) BDM Federal, Inc. 1801 Randolph St., NE Albuquerque, NM 87106			8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Research Institute for the Behavioral and Social Sciences ATTN: PERI-IJ 5001 Eisenhower Avenue Alexandria, VA 22333-5600			10. MONITOR ACRONYM ARI			
			11. MONITOR REPORT NUMBER Research Report 1697			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.						
13. SUPPLEMENTARY NOTES COR: Michael R. McCluskey						
14. ABSTRACT (<i>Maximum 200 words</i>): This report documents development of the Brigade Battle Staff Training System (BDE-BSTS). BDE-BSTS, a set of functional area training packages for brigade-level staff officers, is a combination of text and computer-based instruction (CBI). Sponsored by the Advanced Research Projects Agency (ARPA), the BDE-BSTS was developed for use by the U.S. Army National Guard (ARNG). The prototype BSTS comprised 13 courses for training brigade staff officers in individual functional areas and those tasks required to prepare staffs for collective battle staff tasks. The BSTS program, sponsored under the ARPA program umbrella of Simulation in Training for Advanced Readiness (SIMITAR), is coordinated with three other programs: Simulation-Based Mounted Brigade Training Program (SIMBART), Simulation-Based Multiechelon Training for Armor Units (SIMUTA) and Combat Service Support (CSS) Training System Development for the National Guard.						
15. SUBJECT TERMS Brigade staff training Battle Staff Training System (BSTS) Staff functional area training						
16. REPORT Unclassified			17. ABSTRACT Unclassified		18. THIS PAGE Unclassified	
19. LIMITATION OF ABSTRACT Unlimited			20. NUMBER OF PAGES 69		21. RESPONSIBLE PERSON (Name and Telephone Number)	

Research Report 1697

Brigade Battle Staff Training System

Charles R. Andre
BDM Federal, Inc.

Margaret S. Salter
U.S. Army Research Institute

Infantry Forces Research Unit
Scott E. Graham, Chief

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel
Department of the Army

June 1996

Army Project Number
2O263007A794

Education and Training

Approved for public release; distribution is unlimited.

FOREWORD

The U.S. Army Research Institute for the Behavioral and Social Sciences' Infantry Forces Research Unit has over the past several years conducted research designed to improve training and performance for battalion and brigade staff officers. This report documents the design and development of 13 courses of instruction delivered for the Brigade Battle Staff Training System (BDE-BSTS). BDE-BSTS is a set of 13 training packages for brigade-level staff officers, a mixture of text and computer-based instruction. Developed for use by the U.S. Army National Guard, the work was sponsored by the Advanced Research Projects Agency (ARPA) as an advanced technology demonstration under the Simulation in Training for Advanced Readiness program. The work was performed by BDM Federal, Inc.

The BSTS concept has potential for enhancement of other training. Adaptable for any course of instruction, the BSTS model can become a cornerstone for individual and small-group training. It can be used for distance learning and to augment institutional or unit training for newly assigned personnel. The BSTS program has been briefed to personnel throughout Training and Doctrine Command and is being adapted for implementation in the Force XXI Training Program.

ZITA M. SIMUTIS
Deputy Director
(Science and Technology)

EDGAR M. JOHNSON
Director

ACKNOWLEDGMENTS

Many people contributed to the development of the Brigade Battle Staff Training System. Primary among them were: Joe Albrecht, Randy Bell, Lori Byrd-Spring, Jim Centric, Jim Dillard, Karen Foster, Bill Godwin, Jennifer Kasprzyk, Steve Livingston, Linh Nguyen, Dan Priban, and Judy Zittrauer.

BRIGADE BATTLE STAFF TRAINING SYSTEM

EXECUTIVE SUMMARY

Research Requirement:

The Battle Staff Training System (BSTS) was designed to address an identified need for staff functional area training for maneuver battalion and brigade staff officers. Recognizing that the need for such training was especially critical for the Reserve Component, the Advanced Research Projects Agency and the U.S. Army National Guard supported the development of the prototype BSTS for experimental application in the National Guard under the program Simulation in Training for Advanced Readiness.

Procedure:

In order to train individual staff skills through a multimedia approach using computer-based instruction complemented by text-based materials, 13 doctrinally based staff training modules were developed. Included in the brigade set are interactive software and text-based supporting materials for the Executive Officer, S1, S2, S3, S3-Air, S4, S5, Fire Support Officer, Signal Officer, Chemical Officer, Engineer, and Air Defense Artillery Officer. An additional Common Core Course provides information used by all staff officers. The brigade courses parallel previously developed battalion staff courses.

Findings:

The prototype program, on a 486 PC with CD ROM with specific software, has an introductory tutorial to teach all operational functions. Each course module provides core material necessary for the officer to function in the assigned staff position. There are practical exercises, diagnostic pretests, within-topic quizzes, and a final examination to measure progress and provide feedback. The BSTS permits the staff officer to train at his own pace at home, in the unit, or at the armory.

Utilization of Findings:

While the Reserve Component need provided the initial opportunity for development of a prototype entry-level training system, other applications are apparent. The Force XXI Training Program at Fort Knox has sponsored an expanded BSTS with commander modules, comprehensive examinations, and remedial lessons. Additional research at the Joint Readiness Training Center Leader Training Program may further enhance the program for training staff synchronization and integration.

BRIGADE BATTLE STAFF TRAINING SYSTEM

CONTENTS

	Page
INTRODUCTION	1
Background	1
Prior Research	2
METHOD	3
Instructional Overview	3
Courses of Instruction	4
Instructional Concept	5
Development of Instructional Content	5
Training Management	8
Authoring of Courseware	9
Realism in Training	10
Quality Assurance	11
RESULTS	11
Testing and Evaluation	14
CONCLUSIONS	15
REFERENCES	17
APPENDIX A. LIST OF ACRONYMS	A-1
B. HARDWARE AND SOFTWARE CONFIGURATION	B-1
C. INTRODUCTION TO BDM'S ENVIRONMENT FOR MULTIMEDIA INTERACTIVE INSTRUCTION.....	C-1
D. DEVELOPMENT OF COMPUTER BASED INSTRUCTION	D-1
E. BETA TESTING SUMMARY	E-1

LIST OF TABLES

Table 1. Estimated Number of Course Hours	12
---	----

LIST OF FIGURES

Figure 1. Model course map	4
2. Training development model	7
3. EMMii hardware architecture	8
4. CBI design model	10
5. Testing process model	13

BRIGADE BATTLE STAFF TRAINING SYSTEM

Introduction

This report documents the development of the courses of instruction for the Brigade Battle Staff Training System (BDE-BSTS). BDE-BSTS, a set of functional area training packages for Brigade level staff officers, is a combination of text and computer-based instruction (CBI). The packages include CD-ROM based programs, supplemental text-based instruction, and an embedded instructional and training management system. Designed primarily for local area networks, or wide area network linked training systems, the BDE-BSTS was developed for use by the U.S. Army National Guard (ARNG). The work was performed by BDM, Federal, Inc., at Fort Benning, Georgia from August 1994 through February 1996 under contract to the Advanced Research Projects Agency (ARPA) and the Army Research Institute (ARI), Infantry Forces Research Unit.

Background

The ARPA Land Systems Office and the ARNG Advanced Distributed Simulation Program have focused on the unique training needs of the Reserve Components. Part of the training challenge for ARNG combat arms staff members is due to conflicts with other required duties. To help alleviate this problem, the ARPA, ARNG, and ARI initiated development of distributed, multi-media (paper-based and computer-based) instruction for staff personnel. A prototype thirteen course battalion battle staff training system (BN-BSTS) was developed (Andre' & Salter, 1995). This BSTS prototype was then expanded to include the increased horizontal and vertical coordination responsibilities of the brigade staff. This report documents that expansion, the prototype BDE-BSTS. The resulting two BSTS training systems provide prototype training programs to cover individual battalion and brigade staff functional areas and those tasks required to prepare staffs for collective battle staff tasks.

The BSTS program, sponsored under the ARPA program umbrella of Simulation in Training for Advanced Readiness (SIMITAR), is coordinated with three other programs: Simulation-Based Mounted Brigade Training Program (SIMBART), Simulation-Based Multiechelon Training for Armor Units (SIMUTA) and Combat Service Support (CSS) Training System Development for the National Guard. Both BSTS programs applied innovative research, application, and technologies of instructional design, computer science, and multi-media training strategies. The BDE-BSTS, like the BN-BSTS, will be distributed to two ARNG test brigades which will participate in separate evaluations at the National Training Center (NTC).

Prior Research

The need for formal battle staff training, especially for units training for rotations to a Combat Training Center (CTC), became evident from ARI's research on home station determinants of effective unit performance at the CTCs (Holz, Hiller & McFann, 1994). The analysis of unit performance at the NTC and the Joint Readiness Training Center (JRTC) indicated that special training for the battle staff (especially orders drills) could lead to better unit performance.

Research that focused on light infantry units showed that training in the appropriate functional area was generally not provided prior to assignment to maneuver battalion staff (Thompson, Thompson, Pleban & Valentine, 1991). The only officer training available was conducted as on-the-job training. As a result, the battle staff did not recognize deficiencies in synchronization of critical command and staff activities until after a rotation was under way or completed.

The battle staff competency issue has been addressed and research conducted on the problem of training battle staffs. An interim solution, The Commander's Battle Staff Handbook (Pleban, Thompson, & Valentine, 1993) was developed, and distributed to both Active Component (AC) and Reserve Component (RC) personnel. The handbook describes individual battalion battle staff duties, responsibilities, and references for key staff/slice officers and the command sergeant major. It was developed from staff material provided by TRADOC branch schools, interviews with subject matter experts, and from the assessment of unit performance by observers at the CTCs. This handbook was the primary base document for the BN-BSTS courses. A similar product, Brigade Commanders Battle Staff Handbook (Valentine & Andre', in preparation), served as the foundation for the BDE-BSTS.

BDE-BSTS, like BN-BSTS, also incorporated the concept of organizational competence (Olmstead, 1992). Olmstead's tenets became training objectives in a common core course of instruction and were integrated into the remaining courses. The intent was to ensure that officers and the staff possess the skills required to fully synchronize individual efforts into the collective staff effort. This should lead to improved performance during the planning, preparation and, to a lesser extent, execution phases of a given mission or individual/collective tasks.

Method

The primary developers of the instructional materials were a team of subject matter experts (SMEs) with extensive experience serving on AC and RC Brigade battle staffs, in combat and at the CTCs. They determined the individual training objectives for each course, using as primary reference the Brigade Commander's Battle Staff Handbook (Valentine & Andre', in preparation) and doctrinal materials. The handbook and the preceding battalion project provided the foundation for the front end analysis and task lists. SMEs surveyed existing formal courses, Army doctrinal publications (Field Manuals, Mission Training Plans, Technical Manuals, Programs of Instruction (POIs), etc.), and related materials. Additionally, they used information from Center for Army Lessons Learned (CALL) extracts, trends, reports, and data, and CTC After Action Reviews (AARs).

POIs were written, following the accepted instructional design models of the systems approach to training (Department of the Army, 1982 & 1995). Additional models were created for the design, development and delivery of text-based and CBI training. State-of-the-art hardware and software from the entertainment and computer industries and CBI software development firms were utilized.

Instructional Overview

CBI is the basis for this training system. Staff officer materials are on CD ROM in conjunction with accompanying text-based materials. (Technical specifications are provided at Appendix B.) Decisions on presentation media considered cost and training effectiveness of existing and new materials. Also, CBI presentation supplemented with text-based and companion doctrinal publications provided an inherently more interesting instructional program than existing text-based materials alone. Maintaining student interest was deemed essential because of the independent nature of the training program.

The CBI format was designed to provide the diagnostic, assessment, and performance measurement components of the system as well as provide the primary instructional medium. Although text-based materials supplement CBI, exercises and tutorials and all examinations are presented through the computer.

Additionally, electronic bulletin boards or a "chat" capability (provided by two Shiva net modems) permit access to other staff members. The staff can conduct outside class meetings for problem solving and discussion of course content. This can assist in the preparation for collective tasks.

Courses of Instruction

The thirteen courses of instruction for BDE-BSTS are: Common Core, Executive Officer (XO), S1/Chaplain, S2, S3, S3 Air, S4, S5, Fire Support Officer (FSO), Engineer, Air Defense Artillery Officer (ADA), Signal Officer (SIGO) and Chemical Officer (CHEMO). Each of the courses is composed of a number of subjects. Subjects are groups of lessons which are composed of topics that cover a major learning objective. Figure 1, Model Course Map, shows an example of this structure. Within the Brigade Common Core Course, there are four subjects. Number Three, Staff Functions, contains three lessons (Use of Graphics, Military Briefings, and Staff Integration). Each topic contains several lessons. In the example model, a check mark within a box indicates that the topics are presented through computer based instruction.

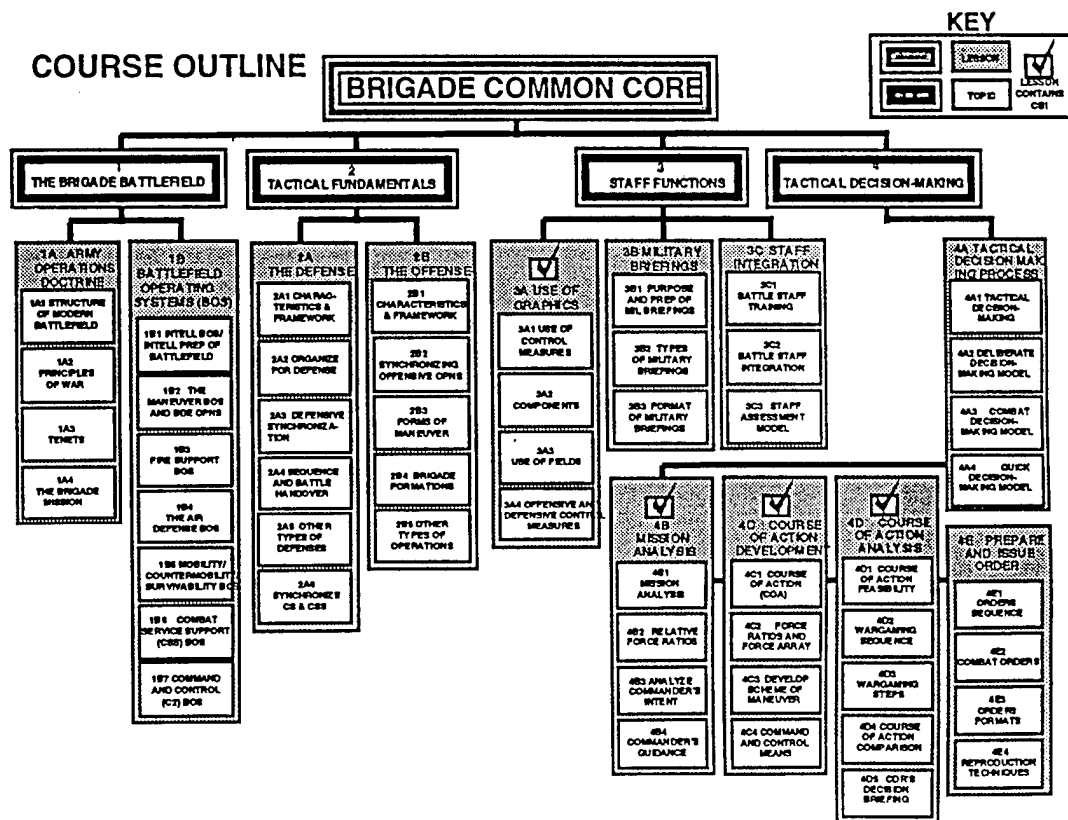


Figure 1. Model course map

Lessons take one or two hours to complete, depending on the student. The training management system, Environment for Multi-Media Interactive Instruction (EMMii), allows the commander, executive officer, training officer, or other designated individual to schedule courses, monitor the progress of individual officers, and manage the authoring of revisions to courses of instruction. (Appendix C provides EMMii background information.)

Instructional Concept

The combination of CBI and text materials included graphics, still photographs, audio, text, and full motion video with audio. Decisions on specific application of media were based on selection of what was deemed the most effective medium for teaching the learning objective. CBI was used where it appeared clearly superior, especially to present high order cognitive tasks and complex tasks that require coordination or synchronization with other tasks. Practical applications (exercises) of skills or knowledge presented were also contained in the CBI. Instruction focuses on mastery of basic skills and knowledge followed by application of critical principles to ensure the student can apply the task in a realistic environment. All diagnostics, assessment, measurement and feedback were included in CBI to provide trainers with the capability of tracking student progress.

The instructional concept places the student in control of the pace and sequence of instruction. Feedback provided to the student informs him or her if the task has been mastered. Computer tracking of status permits trainers in the chain of command to recommend remedial training where needed.

Development of Instructional Content

Courses of instruction were designed for the brigade battle staff, which consists of the commander's primary and special staff as well as the Combat Support (CS) and Combat Service Support (CSS) slices that habitually work with the staff, using the same process as was used in the development of the battalion program. As a result of the program front-end analysis (FEA), one course of instruction was added to the brigade list, the S5, or Civil Affairs Officer. The courses for the S1 and the Chaplain were combined into one (S1/Chaplain) for the brigade program. The needs assessment, conducted to determine the tasks to be trained for the selected battle staff officers, was conducted for each course, and published as an overall brigade task list (Andre', in preparation).

One person was assigned primary responsibility for the design and development of each course of instruction. The contractor SME, in conjunction with an instructional designer, applied a functional job analysis to develop the training objectives and corresponding performance measures to be trained. Figure 2 shows this process. Within the figure, several abbreviations are used for economy of space. The abbreviated words are: Battlestaff Handbook (BSHB); Tasks, Conditions and Standards (TCS); Computer based instruction (CBI); Practical Exercises (PEs); Audio Visual (AV); Quality Assurance (QA); Formative Evaluation (FE), Phases (PH) I, II, III; Contractor Military Expert (CME); Subject Matter Expert (SME); Target Population (TGT POP); and Training Support Package (TSP).

For each course, the authors surveyed and documented relevant doctrinal and training literature, lessons learned, and applicable Army formal courses and instructional materials. Following the literature review, they applied the training development model, culminating in a final version of the text-based instruction with adjunctive materials and tests. Quality assurance (QA) of materials was accomplished in house, by the contractor team, by SMEs for content, and by an instructional designer for application of sound instructional principles.

After QA on the overall instruction, the most complex cognitive tasks, as well as those determined to require integration and synchronization with other complex tasks, were designated for application of CBI. Consequently, storyboards, with attached media, were provided to the CBI authors for development into CBI with specified training application, sequence, branching, and selected media.

Each of the courses also has a listing of associated related professional reference materials (e.g., technical manuals), needed to complete the instruction. Thus, when the course is completed, the staff officer should be technically prepared to perform the required staff function, and should also know to refer, as required, to doctrinal publications for specific application of functional area and staff skills.

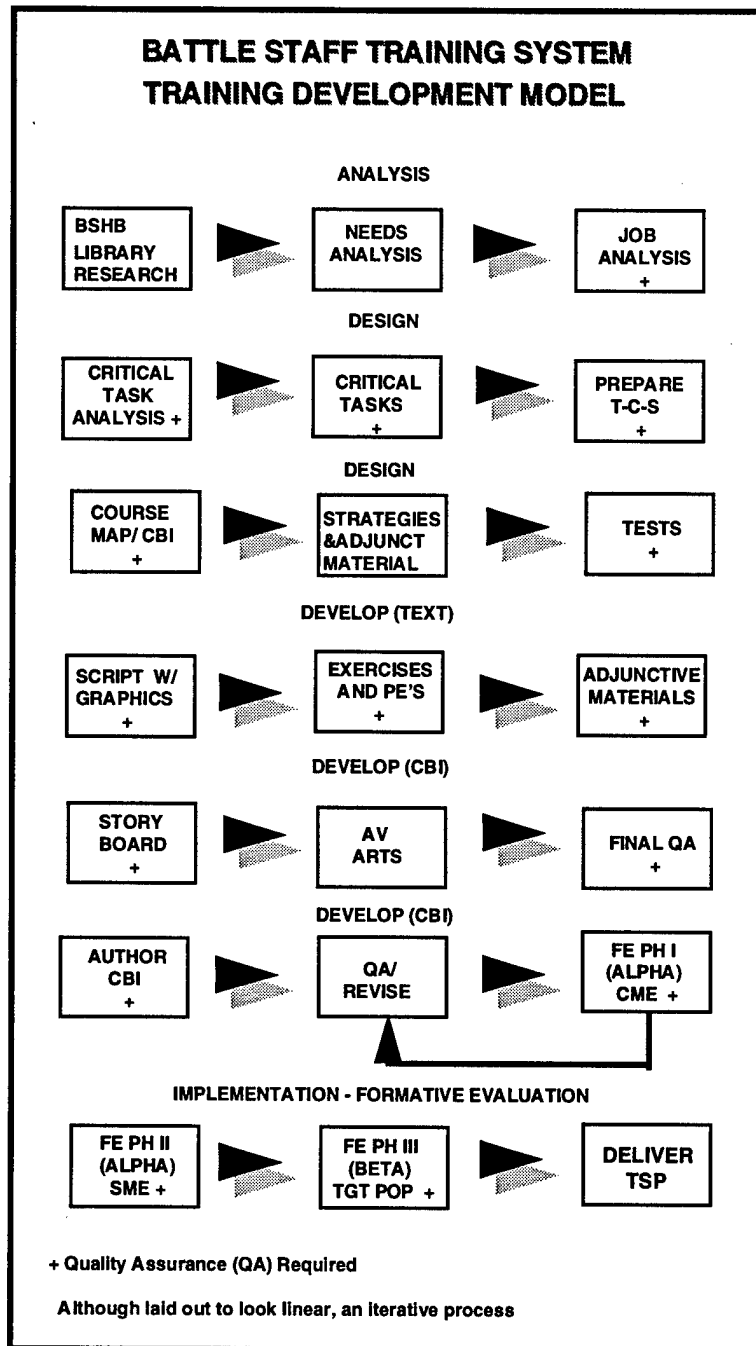


Figure 2. Training development model

Training Management

Management of the training used a modification of the system Environment for Multi-Media Interactive Instruction (EMMii) developed for use with the BN-BSTS, BDE-BSTS and CSS-BSTS programs and designed specifically to enhance the instructor-independent nature of distance learning (see Appendix C for details on EMMii). The EMMii is an enabling environment for multi-media computer-based training development and delivery. It comprises a system that allows trainers or administrators to schedule student training, monitor progress, receive status reports, print results, analyze measurement data for course enhancement, and modify courseware on-line (while students are training on previous versions of the course).

The *Windows for Workgroups* (™) environment provides a familiar look and feel across the training media. A model of the hardware architecture is shown in Figure 3. EMMii uses Microsoft's *Access* (™) database to manage the student's progression through the course of instruction. Course templates standardize the recording of student progress within lessons for posting to the data-base. This allows the trainer to track the

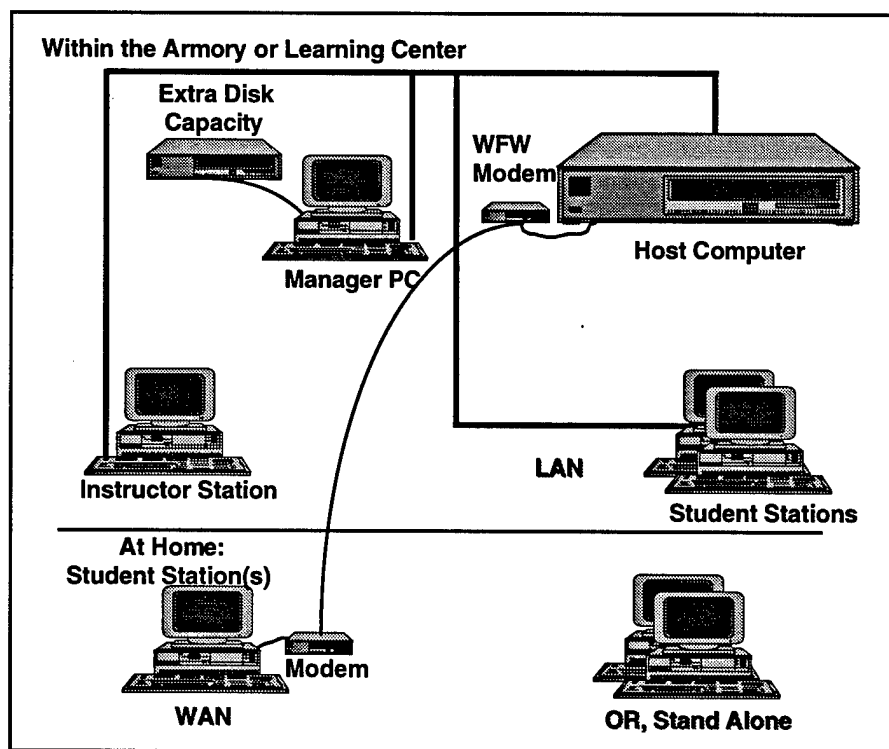


Figure 3. EMMii hardware architecture.

overall progress of the entire staff as they progress in their training.

Authoring of Courseware

CBI development used commercial, off-the-shelf, software. *Icon Author 6.0* (™) was used to develop the CBI, templates, and standards. It has previously been accepted as meeting the selection criteria for an authoring system (Park & Seidel, 1989) and ensures compatibility with the previously developed BN-BSTS and CSS courses of instruction. The *Icon Author* package proved relatively easy to learn, formal training was readily accessible, and experienced users were available. Templates were developed to include learning strategies, techniques for question and answer sessions, testing criteria, screen design, navigation through the courses of instruction, help screens, job aids, and screen layout. (Appendix D contains information on these Instructional Standards.)

CBI development required three skills of the developers: subject matter expertise, knowledge of instructional design, and computer literacy skills. The development team used personnel who possessed both instructional design and CBI design skills to prepare storyboards for future coding into CBI. Authoring systems were available at several locations to ensure QA of all CBI. Most of the templates and Smart Objects developed for use were developed specifically to implement the design standards of the BDE-BSTS program. Additionally, templates and Smart Objects were developed for the diagnostic, performance measurement and assessment component of the system to enhance the overall learning. Figure 4 provides a diagram of the CBI design model.

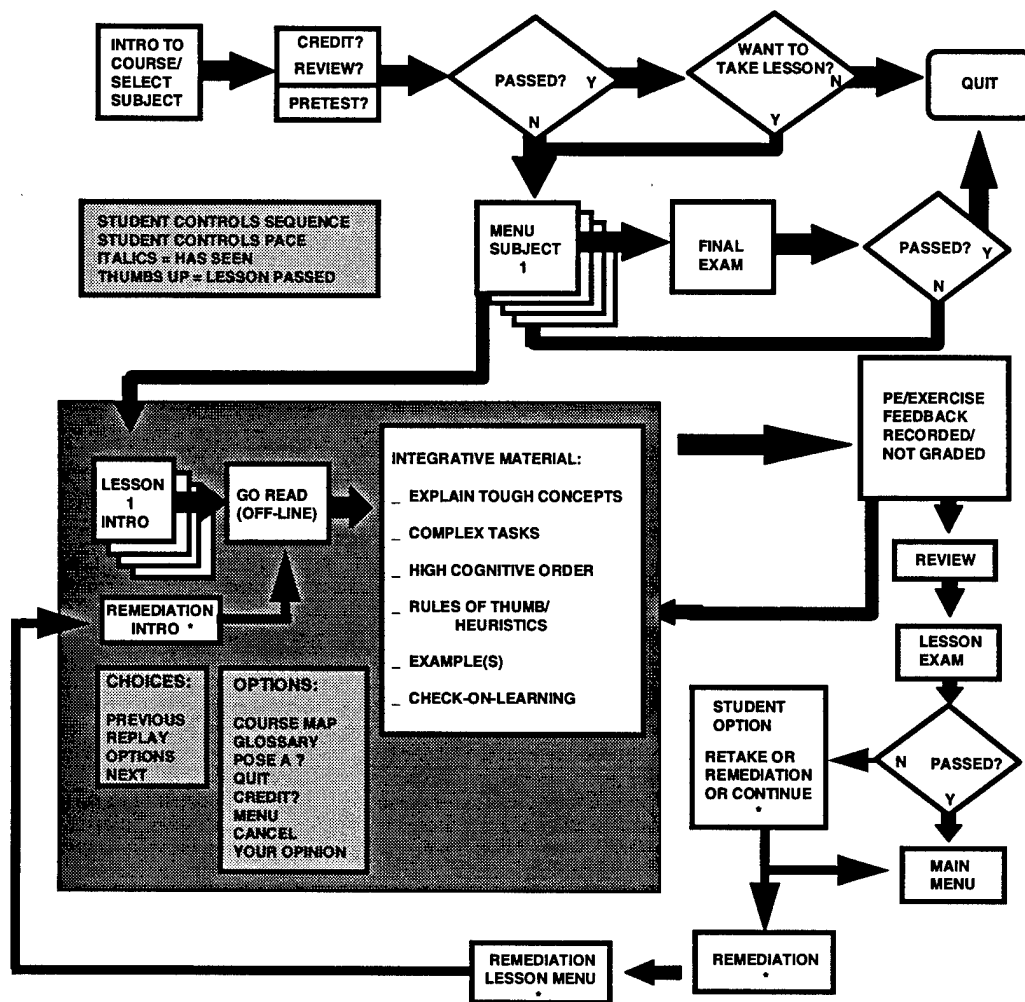


Figure 4. CBI design model.

Realism in Training

The multi-media strategy is particularly valuable for providing realism and retaining interest in the training. This strategy includes the application of tactical scenarios which set the context for the lessons and practical exercises. Realism was created and maintained through the use of common missions. These scenarios, with accompanying orders, annexes and graphics, were utilized in the program to create a viable context for training and to permit the use of tested solutions. This allows the student to review and evaluate the developed solutions. The common scenarios (BN-BSTS, BDE-BSTS, CSS-BSTS, and SIMBART) were built on the NTC-based scenarios developed and used in SIMUTA programs (Brown, 1992). Students are led through the training context (scenario) applying their learned skills to situations

presented. Then, as appropriate, they are provided potential or possible solutions against which to compare their own results.

Quality Assurance

Quality assurance (QA) was integrated throughout the developmental process, as shown in Figure 2 where QA is highlighted. QA for BDE-BSTS was accomplished by SMEs for peer review of content, the instructional designer for standards and instructional integrity, the program manager for content and standards, and computer programmers for functionality of the code; thereby ensuring quality instruction that attained the training objective. QA occurred throughout the process, during development of training objectives, performance measures, text, tests and storyboards, and the CBI process.

Results

Thirteen courses were designed for the BDE-BSTS program. As shown in Table 1 with the estimated number of hours to complete the material, the courses consisted of: Common Core (material common to all positions), Executive Officer (XO), S1/Chaplain (personnel), S2 (intelligence), S3 and S3 Air (operations), S4 (logistics), S5 (Psychological Operations (PSYOP)/Civil Affairs), Fire Support Officer (FSO), Engineer (ENG), Air Defense Artillery (ADCOORD), Signal (SIGO) Officer and Chemical (CHEMO) Officer. The estimated numbers of CBI course hours shown in Table 1 are good approximations; the numbers of hours spent on text may vary with the reading speed and comprehension of the student.

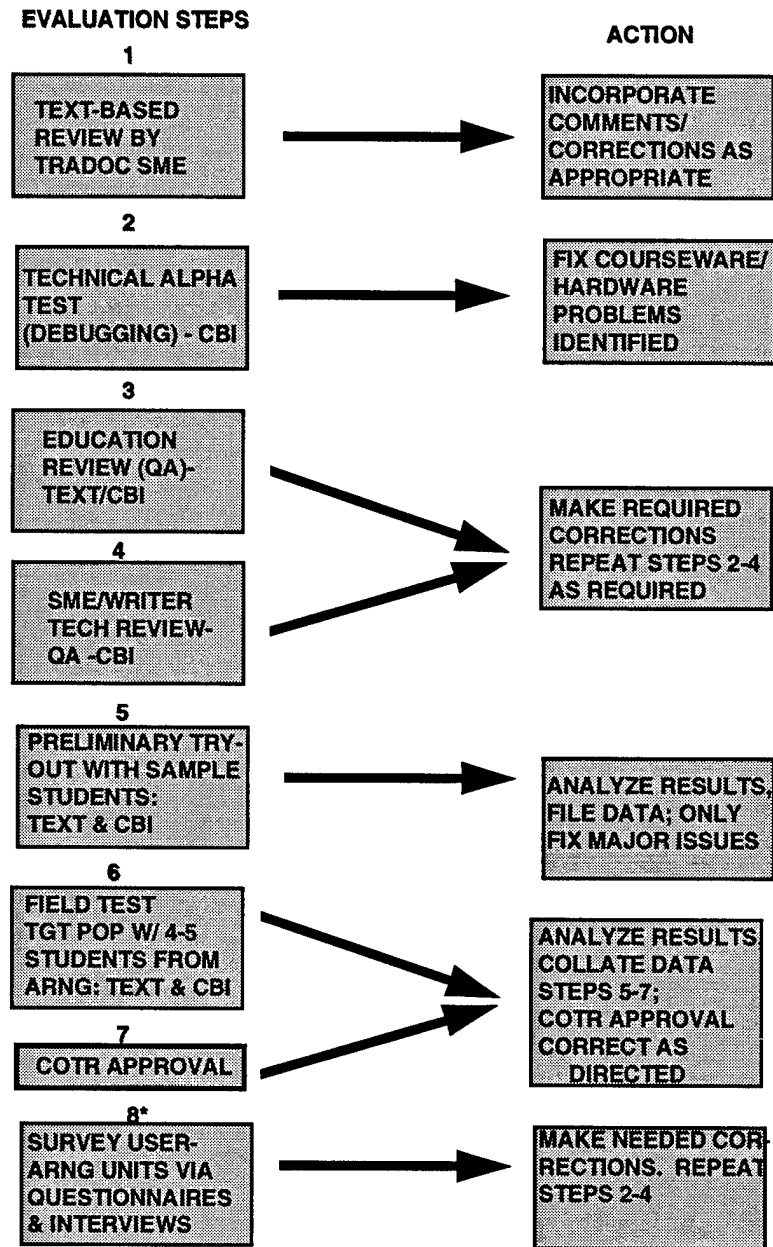
The BDE-BSTS was tested through a formative evaluation (FE) process, as shown in Figure 5. The FE included Alpha testing by 6 to 10 persons who are SMEs in content, computer programming, and/or instructional design. Alpha testing describes the process whereby experts in each of several disciplines examines the material to ensure it meets specific technical standards and criteria. Testers reviewed the text-based materials, CBI, and the complete course of instruction for doctrinal accuracy, instructional soundness and functionality of the computer programming.

Table 1

Estimated Number of Course Hours

COURSE	TEXT	CBI	TOTAL
Common Core	15.8	12.2	28.0
XO	25.7	3.3	29.0
S1/Chaplain	22.4	4.8	27.2
S2	15.0	10.0	25.0
S3	30.0	8.0	38.0
S3 Air	21.7	8.3	30.0
S4	19.1	2.9	22.0
S5	10.9	3.1	14.0
FSO	44.0	6.0	50.0
Engineer	21.4	2.1	23.5
ADCOORD	17.9	10.1	28.0
SIGO	3.6	4.4	8.0
CHEMO	24.7	4.2	28.9
TOTALS	272.2	79.3	351.6

**BATTLE STAFF TRAINING SYSTEM
(EXTERNAL) EVALUATION PLAN
PROCESS MODEL**



* Recommended, not implemented, due to constraints.

Figure 5. Testing process model.

Testing and Evaluation

Alpha testing of the text was initially conducted by 2-3 contractor SMEs with expertise in the specific battle staff position being trained. The text was also reviewed by 2-3 SMEs from Fort Benning and other TRADOC proponents. Alpha testing of CBI was conducted by computer programmers at Fort Benning, GA to ensure the proper operation of all codes.

Beta testing refers to a limited user test, one conducted by a sample of the population for which the training is intended. The Beta test of each course of instruction was completed prior to finalization of the instructional program. Beta test results included specific and overall evaluations of each of the courses of instruction. Of the 12 statements to be rated by every test officer on a post course questionnaire, most all indicated approval of and positive response to the courses. Most of the negative comments were related to the students' desires that more of the lessons be in CBI rather than text. Example statements to be rated on a scale from strongly agree to strongly disagree included responses to: "I believe I had sufficient background knowledge to prepare me for this course;" "The CBI portion enhanced my understanding of the paper-based course material (student guide, FMs, etc.);" "The computer set up and administrative procedures were too much trouble."

In addition, and more importantly, the test officers were asked to comment on each lesson (text, CBI, doctrine, and examinations), each subject, and the student guide, as well as to provide overall comments and suggestions on the course(s) of instruction. The most prevalent free response comment was the request for more CBI. Others requested "more practical exercises and computer based instruction." Some commented on historical references and lessons learned, and on the graphics and humor. There was positive feedback on the quiz format, and the use of CBI in general.

BETA testing of the final course of instruction was conducted on networked hardware. To ensure accomplishment of program objectives, test results and appropriate recommendations were reviewed and approved. Tester comments, changes, corrections and suggestions were reviewed, and as appropriate, were included in the final course materials prior to final printing of the text or cutting of the CD ROM for CBI. BETA test results were provided for each course completed (summary at Appendix E).

Conclusions

The Brigade-Battle Staff Training System was designed, developed, and tested to meet the specific training needs of the ARNG, although it is evident that there may be direct applicability to the AC. The BSTS, currently still a prototype model, could potentially be used at home, in learning centers, in the armory or state academies for individual study, or in a networked configuration in operational units. Personnel could also use the BSTS as a part of or following the Basic and/or Advance Courses prior to assignment as a battle staff officer, or as a supplement to existing courses and professional education programs. Although this project began with individual training modules, it also has potential to be extended upward to from brigade to division. The applicable successes and lessons learned from the BDE-BSTS as well as the parent program, SIMITAR, will enhance the individual training and performance of all battle staffs and individual soldiers.

References

- Andre', C. R. (in preparation). Battle staff training system brigade battle staff individual task list (ARI Research Product). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Andre', C. R., & Salter, M. S. (1995). Battalion battle staff training system (ARI Research Note No. 95-44). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A299 228)
- Andre', C. R., & Valentine, P. J. (in preparation). Brigade commander's battle staff handbook (ARI Research Product 96-09). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Brown, F. J. (1992). Battle command staff training (IDA Paper P2785). Alexandria, VA: Institute for Defense Analyses.
- Department of the Army. (1982). Training. A systems approach to training (TRADOC Reg 350-7). Fort Monroe, VA: Training and Doctrine Command.
- Department of the Army. (1995). Training development management, processes and products (TRADOC Reg 350-70). Fort Monroe, VA: Training and Doctrine Command.
- Holz, R. F., Hiller, J. H., & McFann, H. H. (Eds.). (1994). Determinants of effective unit performance: Research on measuring and managing unit training readiness. Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Olmstead, J. A. (1992). Battle staff integration (IDA Paper P-2560). Alexandria, VA: Institute for Defense Analyses.
- Park, O., & Seidel, R. J. (1989). Selection of a computer-based training authoring system: Functional requirements and evaluation criteria (ARI Research Product No. 89-10). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.
- Pleban, R. J., Thompson, T. J., & Valentine, P. J. (1993). The commander's battlestaff handbook: An introduction to staff functional area duties for new battalion staff officers (ARI Research Product No. 94-02). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A276 139)

Thompson, T. J., Thompson, G. D., Pleban, R. J., & Valentine, P. J. (1991). Battle staff training and synchronization in light infantry battalions and task forces (ARI Research Report No. 1607). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A245 292)

Appendix A

LIST OF ACRONYMS

AAR - After Action Review
AC - Active Component
ADA - Air Defense Artillery
ADCOORD - Air Defense Coordinator
ARI - Army Research Institute
A2C2 - Army Airspace Command and Control
ARNG - Army National Guard
ARPA - Advanced Research Projects Agency
AV - Audio Visual

BDE - Brigade
BN - Battalion
BSHB - Battle Staff Handbook
BSTS - Battle Staff Training System

CALL - Center for Army Lessons Learned
CAS3 - Command and Staff Services School
CBI - Computer Based Instruction
CHEMO - Chemical Officer
CME - Contractor Military Expert
COTS - Commercial Off the Shelf Software
CS - Combat Support
CSS - Combat Service Support

EMMii - Environment for Multi-Media Interactive Instruction
ENG - Engineer

FE - Formative Evaluation
FEA - Front End Analysis
FSO - Fire Support Officer

IPB - Intelligence Preparation of the Battlefield

JRTC - Joint Readiness Training Center

LAN - Local Area Network

NTC - National Training Center

OAC - Officer Advance Course
OBC - Officer Basic Course
OPS - Operations
ORG - Organization

PC - Personal Computer
PE - Practical Exercise
PH - Phase
POI - Program of Instruction
PSYOP - Psychological Operations

QA - Quality Assurance

RC - Reserve Component

SIGO - Signal Officer
SIMBART - Simulation-Based Mounted Brigade Training Program
SIMITAR - Simulation in Training for Advanced Readiness
SIMUTA - Simulation Based Multi-Echelon Training for Armor
Units
SME - Subject Matter Expert

TCS - Tasks, Conditions LAN - Local Area Network, and
Standards
TGT POP - Target Population
TIS - Training Information System
TRADOC - Training and Doctrine Command

WAN - Wide Area Network
WFW - Windows for Workgroups

XO - Executive Officer

Appendix B

HARDWARE AND SOFTWARE CONFIGURATION

As a part of this research effort, hardware and software specifications, compatible with the Battalion and Brigade-BSTS systems, are provided to identify the computer stations and the training management system used. Specifications were finalized to permit procurement of compatible systems under the ARPA program. Requirements include warranty, technical support, and on site maintenance support.

Student Station

Hardware:

486 DX2 Computer; 66 Mhz processor
8-16 Mb RAM, expandable to 32+Mb; 70ns
210-500 Mb Hard Disk
16 bit local bus
101 Key Enhanced Keyboard
Desk top cabinet
9600bps modem, or better, with 10BT RJ45 connector (WAN configuration) **OR** Ethernet adapter (LAN configuration)
Spider Graphics card, or equivalent, with driver to handle 640x480, 256 color and 14" monitor

Software: DOS 6.21; Windows for Workgroups™ 3.11; Icon Author™ Present 6.01; Training Management System (TMS)/EMMii™

Accessories: Surge Strip; 10BT/RJ45 modular plug with 10' cable; Mouse Pad

Manager PC

33Mhz, or faster, 486 PC, 16Mb RAM
200Mb+60Mb per subject, disk storage
9600bps modem, or better, with 10BT RJ45 connector (WAN configuration) **OR** Ethernet adapter (LAN configuration)
2 Shiva net modems (WAN configuration)

Software: DOS 6.21; Windows for Workgroups™ 3.11; Icon Author™ 6.01; Training Management System (TMS)/EMMii™ TIS

Accessories: Surge Strip; 10BT/RJ45 modular plug with 10' cable; Mouse Pad

Author Station

66Mhz, or faster, 486 PC, 16Mb RAM
Action Media II (w/capture)
Sound Blaster 16 (w/speakers)
500 Mb disk storage
9600bps modem, or better, with 10BT RJ45 connector (WAN configuration) **OR** Ethernet Adapter (LAN configuration)
150K/300K double spin CD-ROM or equivalent
Spider Graphics card, or equivalent, with driver to handle 640x480, 256 color and 14" monitor
2Gb Tape Drive

Software: DOS 6.21; Windows for Workgroups™ 3.11; Icon Author™ 6.01; Training Management System (TMS)/EMMii™ TIS and Student; Power Point 6.0

Accessories: Surge Strip; 10BT/RJ45 modular plug with 10' cable; Mouse Pad

Appendix C

INTRODUCTION TO BDM'S ENVIRONMENT FOR MULTIMEDIA INTERACTIVE INSTRUCTION

The EMMii Concept

The training management system as an Environment for Multi-Media Interactive Instruction (EMMii) has been developed by BDM as an enabling environment for multi-media computer based training (CBT) development and delivery. The goals of EMMii are:

- To provide a state-of-the-art environment where trainers can develop computer-based lessons for students, incorporating high quality still photos, full motion video, and audio in the lessons,
- To assist the Training Staff in the management of their curriculum and materials,
- To automate the administration of training,
- To allow students to proceed at their own pace and to refresh themselves as necessary,
- To provide on-line testing in the subjects,
- To record student/lesson performance data in an accessible form, and
- To acquire data about the lessons themselves.

EMMii uses commercial off-the-shelf (COTS) software integrated into a system that allows trainers and administrators to make good use of the specific functionality of the packages. The Microsoft Windows for Workgroups™ environment then provides a familiar look and feel across the packages.

EMMii Hardware and Software

The original EMMii was developed for a 486 PC platform under OS/2™. However, BDM has ported this system to a Windows™ environment. The hardware and software discussed here are for the Windows™ platform.

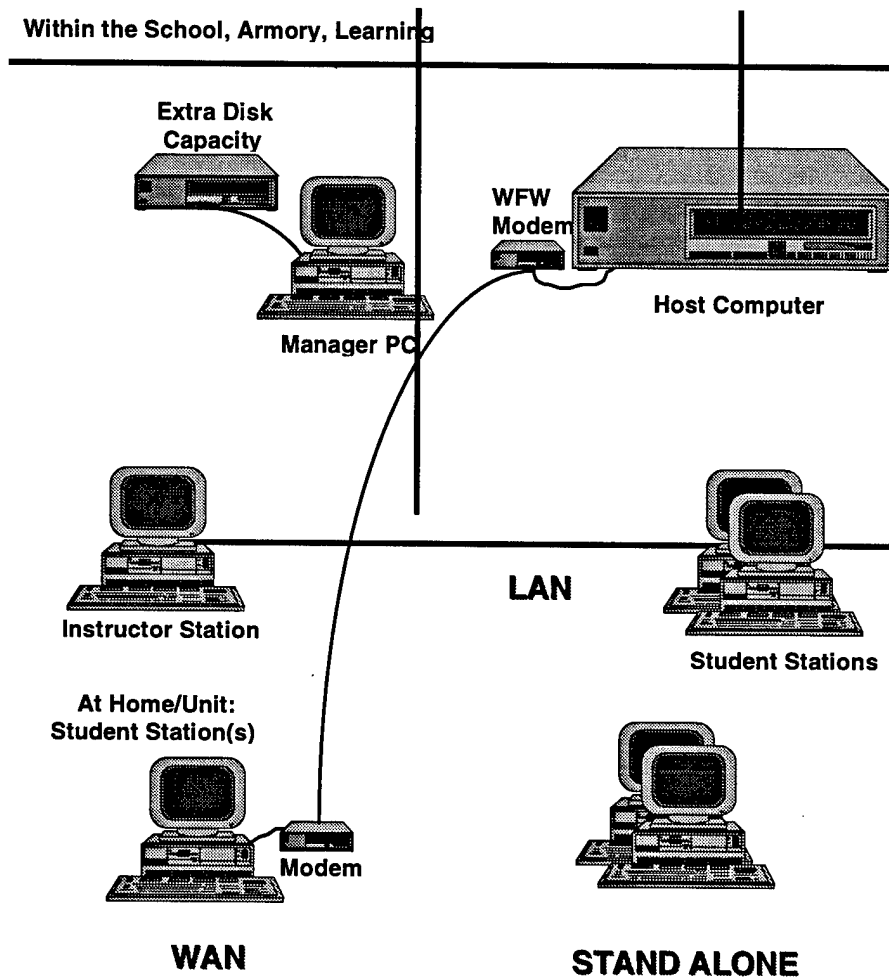


Figure C-1. EMMii hardware architecture

The hardware architecture for this system is illustrated in Figure C-1. EMMii computers are all 486 PCs, attached through a local area network (LAN) and/or a wide area network (WAN) using the computer's internal or external modem, and communicating via Windows for Workgroups™ (WFW). The lessons are stored on

magnetic or optical media serviced through the EMMii "Manager" computer. The Author, Instructor, and Student Stations are 486 PCs also running WFW. The Author and Student Stations should preferably be equipped with multi-media hardware and software for full motion video, high quality stills, and audio. We recommend the Icon Author (TM) application software package for lesson development and display.

Figure C-2 provides brief descriptions of EMMii functional areas. More detailed descriptions are provided later in this document.

Functional Area	Description
Training Information System (TIS)	This is the database interface on the TMS Manager. It maintains data on lessons, subjects, courses, student histories, schedules, et al., for administrators, instructors, and authors.
Author Station	This is a collection of software centered around the authoring package that gives access to files stored on the Manager and allows an Author to create and maintain lessons.
Instructor Station	The Instructor's functions are performed through the TIS which can be accessed remotely through another PC.
Student Station	This software allows the student to log in and then manages the student's access to lessons. This software also ensures that results files are sent to the database (TIS).
Storage Manager	This software resides on the Manager PC. It organizes and tracks the materials that make up the various CBT lessons. It can provide an entire lesson, or allow authors to browse for individual files.
Communications	BDM's software uses Windows for Workgroups (TM) to communicate between stations.

Figure C-2. EMMii functional areas.

All of the functional areas are interrelated and communicate with each other via messages, files, and database queries. Figure C-3 illustrates the interactions between the Authoring Station, the Storage Manager (a component of the Manager PC), the TIS, the Instructor, and the Student Station.

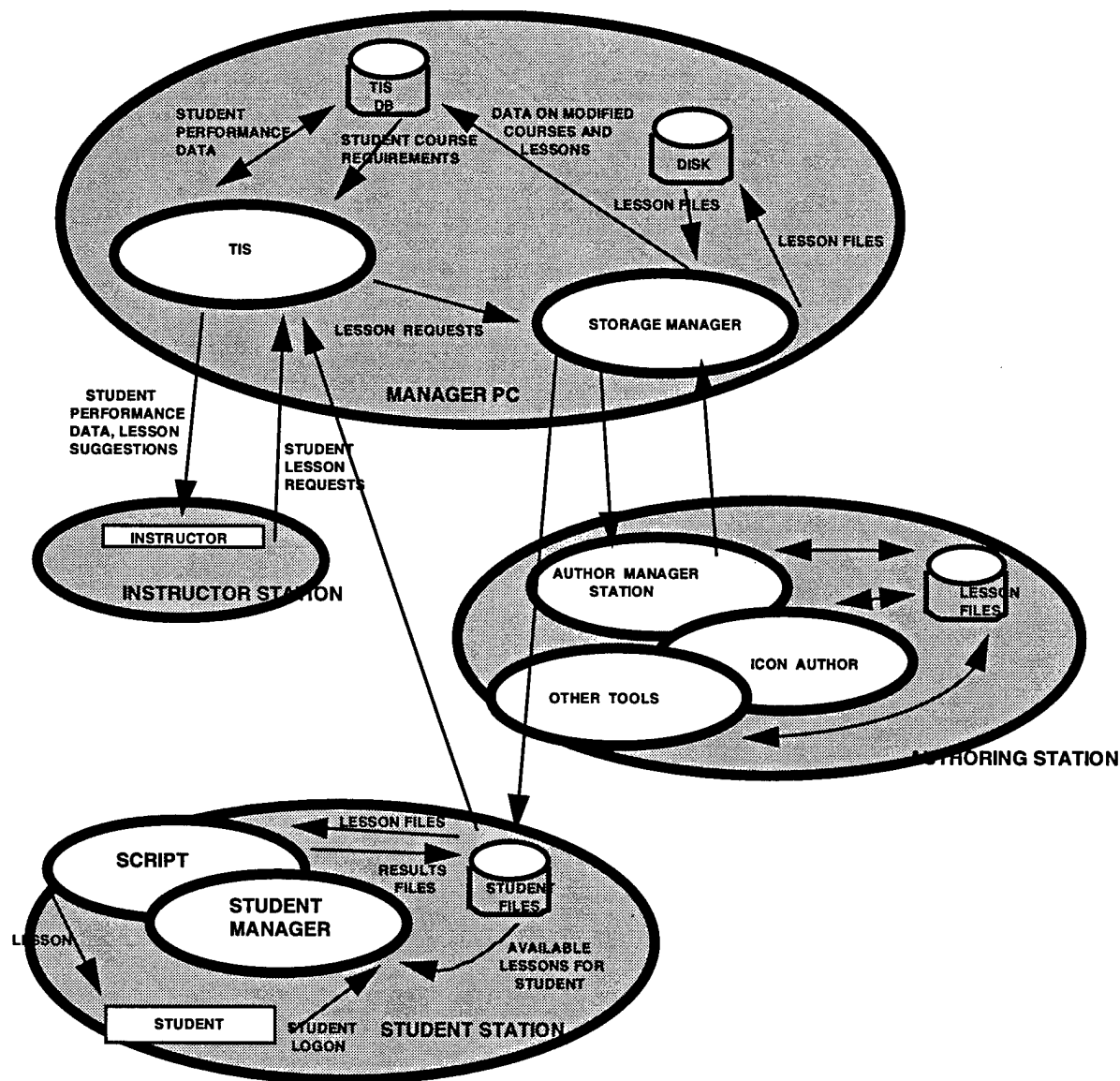


Figure C-3. Interactions of EMMii functional areas.

An author can get any previously created files and templates from the Manager while on his PC. Lessons are created using the

multi-media authoring package IconAuthor(TM). An author can actually work on a lesson locally without manager interaction once all the necessary files are downloaded to the authoring station. When the lesson is completed, procedures on the authoring station are used to check the lesson back onto the manager station where the lesson and its associated files are stored.

The TIS, which has knowledge of the lessons and their suggested order within the course, allows an instructor to schedule students for particular lessons and at specific student stations. The storage manager and the student station then manage the download of the lesson files and the students' own data (both schedule and bookmark) to the student stations.

When a student takes a lesson, the results (exam results, questions from pose a question, and any opinion comments) and bookmark (where the student ended within a lesson) are collected at the prescribed student station. Upon completion of a student's session, the results are transmitted to the database. If no other students are scheduled for the same station/lesson within 24 hours, the lesson is automatically deleted from the student station upon completion.

EMMii Course Structure

The highest level of organization within EMMii is a course. A course consists of subjects, and the subjects are made up of one or more lessons. The organization is illustrated in Figure C-4.

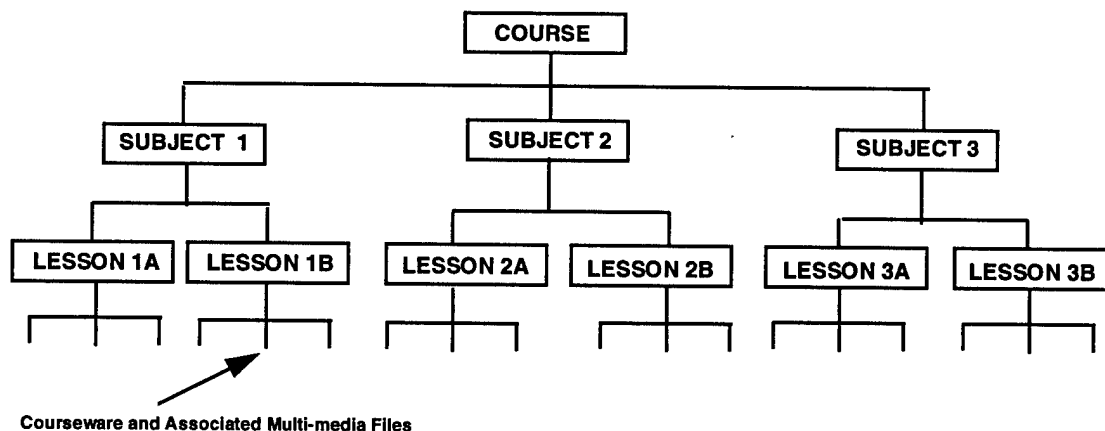


Figure C-4. EMMii course structure.

Normally only one author will work on a lesson. The lesson consists of a multimedia presentation produced by an author as well as text files, audio files, stills, motion video, and graphics files used in the presentation. All of these files, as shown in Figure C-5, become associated with the lesson and are stored on the manager PC after the lesson is checked in through the authoring software.

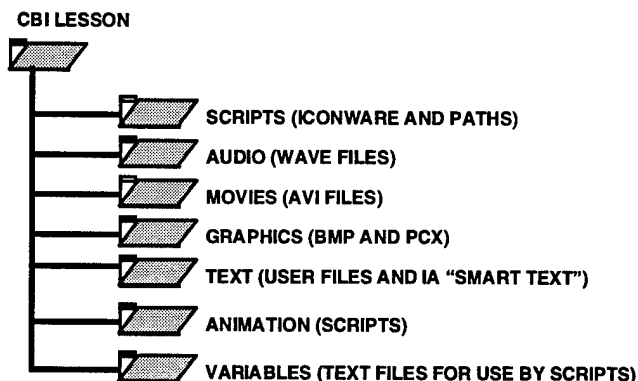


Figure C-5. An example lesson and associated files.

The files are downloaded to users (authors, instructors, and students) whenever the lesson is referenced. The display type and suffix of the files are maintained by the storage manager to allow identification at the other levels when downloaded.

Maintenance of files and versions of files are performed by the storage manager (on the manager PC). Common files may be shared by lessons within a subject, by subjects within a course, or by courses within the entire system.

EMMii Functionality

The following provide somewhat more detailed descriptions of the EMMii functions than were provided in Figure C-1.

Author Station Software

Most of EMMii is interactive. Figure C-6 shows a typical EMMii screen. This particular screen is used by authors to enter short descriptions of their files, in order to make browsing easier when the lesson is stored.

Project File Description

Description: 50 Characters Maximum
 Questions/Ansrs on E-Mail

Common to
☐ All
☐ Course
☐ Subject
☒ Lesson

BACKGRND. BMP
 BOOKMARK.IW
 BOOKMARK.VAR
 CHAPTERS.VAR
 CHKBKMK.IW

☐ Reference Title Sort by ☐ File Name ☒ File Type

Current Project
 d:\WFW\projdisc.tms Select Project

Display Required Files Accept Cancel Help OK

Figure C-6. Typical EMMii screen

In addition to the scripting functions provided by the IconAuthor™ package, the EMMii author station software provides the following specific functions:

- Temporary storage and retrieval of lessons
- Fetching files from previously stored lessons
- Checking common file usage
- Entering descriptions of lesson files
- Checking lessons in and out of the storage manager
- Creation of a new lesson

An author may also want to use the TIS to look at course organization as well as student results. The TIS can be accessed through the author administration functions.

Along with the EMMii author software, special IconAuthor templates and subroutines have been developed to allow authors to retrieve and use data provided by EMMii (such as the bookmark, course/ subject/lesson names) and to provide data back to EMMii upon completion (scores, answers, updated bookmark, student assessments). Other special templates have been developed to "automate" some standard procedures (use of the bookmark, certain test-types, et al.) In addition, BDM, in concert with subject

matter experts and training developers, can develop custom templates and shells to be used throughout the organization's courseware, to give it a standard look and feel.

Instructor Station Software

Instructors perform their work through the TIS. The TIS can be accessed through both the author administration and the instructor PCs. The TIS allows an instructor to schedule student sessions, view results, and look at course structure.

The other TIS functions used by an instructor include:

- Querying the status of a student station
- Adding and deleting permanent lessons from student stations
- Aborting a student's session

Student Station Software

The student station software consists of one log-in screen which is always displayed when the station is turned on (booted up). In addition, it contains several background processes that:

- Receive "schedule" messages from the database and initiate lesson downloads
- Ensure that students receive the lessons for which they are scheduled
- Retrieve student test results and bookmarks and log them to the "Host" computer (either the Manager Computer or the Instructor Station)
- Clean up the student's results and course materials after completion.

The Training Information System (TIS)

The TIS serves several purposes within EMMii. Its primary function is to provide course administrators and instructors with information about courses that are available and information

about student training activities. The TIS also maintains detailed records on student training performance and on student assessments of the training received. In addition, the TIS assists the instructor's scheduling of students for particular lessons at specific stations for specific times; thereby avoiding conflicts with student time and station scheduling, maximizing utilization of stations, and helping to assure that students receive training in the proper sequence. Figure C-7 shows a typical EMMii TIS screen, this one reporting on the students who have taken a particular lesson.

Id	Name	Date	Done	Grade	Hours	Bookmark	Approved
0123456789	Onetozero	5/31/94 5:26:11PM		94	21	18	X
9876543210	Ninetozero	5/31/94 5:27:58PM			87		

Figure C-7. Typical EMMii TIS screen

EMMii uses the Microsoft AccessTM relational database management system software. Using Access provides a similar look and feel to the other EMMii functions. The TIS consists of over 50 screens and reports that allow a user to:

- Add/delete students
- Organize curricula
- Schedule student training sessions
- View training status by student or by lesson
- View exam results by student or by lesson
- Archive course materials

The Storage Manager

The purpose of the EMMii storage management module is to provide a transparent disk storage system where users on any station are unaware of the actual storage structure used for EMMii lesson files. The storage manager provides

- an efficient storage and retrieval system for individual EMMii lesson files
- an efficient system for transferring complete lessons between PC workstations and the manager system

Given the probability that the lessons developed will undergo changes with time, configuration management of the courseware is performed by the storage manager. The software also allows designation of files as common to several lessons, decreasing storage space, and making global changes easier to perform.

Communications

The EMMii communications software resides on each PC in the system. It uses Windows for Workgroups to perform message and file transmission over an existing LAN or WAN through the use of a modem and standard telephone lines. In addition, small local databases are used by EMMii software to allow machines in the system to access data about what is happening on another PC (such as instructor/student station interactions).

Appendix D

DEVELOPMENT OF COMPUTER BASED INSTRUCTION

Introduction

Early in this program, BDM developed a process for setting standards and completed two iterations of meetings to develop standards for the Computer Based Instruction (CBI) used in both the Battalion Battle Staff Training System (BN-BSTS) and the Forward Support Battalion (Combat Service Support) Training System (CSS-BSTS) for the Army National Guard.

Since the initial development, the standards have continued to be refined. This report explains the standards used by BDM in developing the Battle Staff Training System. There are also references to the data collected and sent to the armory via the training management system, EMMii - Environment for Multi-Media Interactive Instruction.

The areas addressed for CBI Delivery Standards are in Figure D-1. Descriptions and details of the components of each standard are contained below.

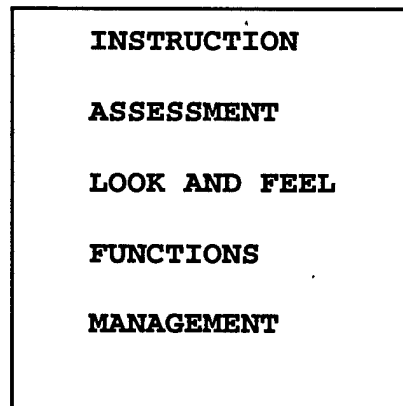


Figure D-1. CBI delivery standards.

Instruction

Objectives. The enabling knowledge for entrance into the CBI includes a basic literacy with computers and completion of the Officers Basic Course (OBC) and Officers Advanced Course (OAC) for the respective branch officer for all courses except S3 and XO where completion of Command and Staff Services School (CAS3) and Command and General Staff School is recommended. Additionally, officers are required to be branch qualified for their grade (e.g., served as a platoon leader, executive officer or specialty platoon leader or assistant staff officer for a primary staff position (S1, S2, S3, or S4), company commander and primary staff officer for S3 and XO).

Prior to beginning a specific staff officer functional course, all members of the battle staff will complete the lessons in the Common Core Course.

The three levels of learning for a lesson include Level 1 - fundamental skills (individual definitions and components of the staff functional area), Level 2 - individual problem solving (give a problem, apply knowledge, produce a behavior), and Level 3 - application of basic skills, production of individual staff output, and practical exercises. (Collective tasks may be initiated in a future program to train dyads and triads (small staff teams) and then full staff training through the SIMUTA and SIMBART programs.) The form of training objectives is Task - Condition - Standard.

The organizational competency model follows Olmstead's model with the terminology modified to better meet the needs of the target audience.

The instruction allows students to take the subject "for credit", in which case test results are recorded. However, if the student chooses to take a subject for reference, merely to peruse a subject, some tests will not be made available.

Scenario and METT-T. Common scenarios, based on the NTC and synchronized with the SIMBART, SIMUTA and CSS programs, drive the basic skills and problem solving stages of instruction. The common scenario normally drives levels 1 and 2; or scenarios tailored for the individual training objective are adapted for stages 1 and 2, when required. The factors of enemy, troops, and terrain (and weather) are stabilized for training in all stages. However, the factor of mission is varied for offense and defense.

Course Structure and Mapping. The highest level of structure is the course (S1, S2, S3, ... SIGO). Courses are 10-50 hours duration. The next (lower) level of structure is the subject. A subject is a grouping of lessons. (See Figure D-2.) The subject is a piece of IconAuthor ^(TM) courseware and associated multimedia files. Most subjects are of 1-2 hours duration (in the CBI). Within the lesson there are topics.

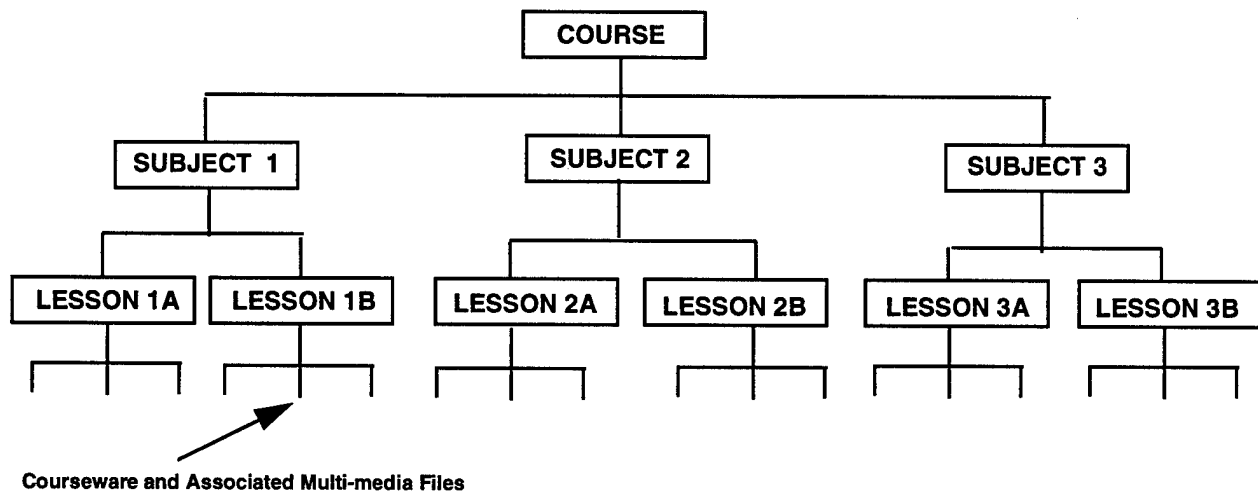


Figure D-2. General EMMii curriculum structure

Each course is a mixture of text-based material and CBI. All criterion referenced assessment, performance measurement and diagnostic testing is done within the CBI. There is a short (5-10 minute) introductory CBI subject for each course and lesson as well as a pretest (see testing, page D-8). The lessons themselves are available through a menu in the CBI. The introduction stresses the importance of the material to the officer's job and how the particular material fits into the overall curriculum. It also indicates what doctrinal reading should be done in conjunction with the lesson and prior to taking the exam. For some lessons, the introduction and exam are the only components of the lesson within the CBI. Other lessons include additional CBI material (tutorials, practical exercises, or examples from lessons learned) to strengthen the learning. Lessons with CBI are indicated by a check mark on the course map. The course map is included in both the student guide and CBI (see section below). There is more on testing philosophy, navigation, and structure in later sections.

Strategies. The specific strategy applied to achieve a specific training objective was selected by the development team SMEs in conjunction with the instructional designer following the model of design and development upon which each team member was trained. The strategies applied in the course development process are: tutorial, drill and practice, guided discovery, problem solving, simulation, games, and cooperative learning. Practice is incorporated to the maximum extent possible to attain the training objective.

Training for the development team included the best application of a strategy to a specific training objective. The SME development team was also trained in behaviorally-oriented principles of instruction which are appropriate to consider in designing specific instructional strategies.

Types of Interaction. For each strategy selected, the SME has designed the appropriate type of interaction to best achieve the training objective. Types of interaction include recognition, recall, comprehension, application/analysis, synthesis, and evaluation. (See also section on feedback, diagnostics, and testing, below.)

Role of the Mentor. Clearly, the optimum method to achieve a high performing staff member and battle staff, particularly in high order cognitive tasks, is through the availability of a mentor during the process. An instructor or trainer is strongly recommended and can be made available through the E-Mail and Chat functions provided through the EMMii and Windows for Workgroups (WFW). (See section on support systems, below.) At any time students have the ability to pose a question that will ultimately be posted for response by a mentor, instructor, or trainer. As the battle staff progresses through the course structure (stages I - III), there may be an increased need for the mentor, instructor, or trainer.

Motivation. Techniques applied by the SME/design team to motivate the student (and overcome the commonly observed attrition effect in distance learning) include humor, fantasy, games, challenges, and competition with self and/or others. These techniques are applied based on the learning stage, type of skill and instructional method.

Principles for Media Use. Use of media is tailored to the training objective and to meet the test of effectiveness (training and cost). Video is used judiciously for key points, to gain attention, or for motivation. It is applied for demonstration of principles, equipment, lessons learned, to provide a historical perspective, and, to a minor extent, for variety.

Most screens use audio to emphasize key points and supply additional information to the learning. A male voice is used for the target population. Existing (TASC) audios or videos have been used in some cases; however, most have been developed by the SME, and produced by the CBI team, specifically to support the learning objective.

Text, at a 10th grade reading level, is used on most every screen and amplified with audio, video, graphics, photo stills, or animation. Animation is used judiciously for motivation or variety.

Graphics and photo stills are used to anchor a learning objective and apply doctrinal publications (Field Manuals, ARTEPS, and Tactics, Techniques and Procedures) to ensure the officer can quickly refer to the doctrinal publication in field application.

Assessment

Diagnostics and Prescription. Each subject area begins with a diagnostic test (pretest) that is identical to the final subject examination. The student is not given the correct answers to the pretest questions. However, he is shown which questions he missed and is told (on the main menu) the lessons he did well enough on to skip over during the lessons for the subject. If the student desires, he has the opportunity to complete lessons on which he has, through the diagnostic pretest, demonstrated mastery.

Testing. There are three types of tests: quizzes, lesson exams, and pretests/final exams. Quizzes are graded to provide the student a measure of his performance; but results are not stored in the database for future analysis. Exams (lesson and final) and pretests are graded, issued a percentage score, identified as to pass/fail, and stored for analysis and review. A student may take any quiz, lesson exam, or final as many times as he wishes.

Each subject begins with a pretest that the student must take before taking the subject for credit. The student may take this test only once. The EMMii tracks that the pretest has been taken and does not permit it to be re-taken. If the student passes the pretest (achieves a score of 80% or better on each lesson in the subject), he is considered to have passed, and can either proceed to another subject, or continue with the one at hand. Students may always return to a subject they have taken previously for review or additional study.

There is also a final mastery exam which covers the entire subject. The final is identical to the pretest (except that the questions are re-ordered and feedback is given on the correct answer and where the student can gain the information to learn the objective measured by the question.) A minimum score of 80% is required for mastery before the student is considered to have "passed/receive a GO" on the subject.

The examination format is multiple choice or a derivative thereof in most cases, as the computer cannot (easily or accurately) grade subjective type examinations. Derivatives of the multiple choice include matching, true-false, sorting, choose from a list, choose spots or locations on a map, or graphic, or use of fill-in-the-blank.

Within each subject, each lesson has an associated lesson examination. This exam is graded and recorded in the data base. A minimum score of 80% is required for mastery. Mastery of the material is required before the CBI will advise the student to move to the next lesson or the exam. Most lessons also contain quizzes or practical exercises (PEs). The PEs may or may not have "correct" answers associated with them. Most have only "suggested" answers designed to encourage the learning of the cognitive concept or model behind the PE for application under different factors of METT-T. Responses to questions in PEs are neither graded nor recorded, to encourage the battle staff officer to take risks, try new concepts and enhance the cognitive learning process.

Feedback on Test Performance and Remediation. As mentioned in the section on testing, there are three types of tests used. The answers and scores on two of the three types are recorded within the EMMii. The following addresses user feedback on each type.

Quizzes and exercises are designed to instruct the user in terms of what has been learned or still needs work. Immediate (right or wrong for quizzes) feedback is given on each question, with reinforcement for right answers, and inferences as to what is correct for wrong answers. In some cases the question is re-asked when the answer is wrong. The PEs also apply this feedback concept.

Fill-in-the-blank exercises are used sometimes. The computer grades these by comparing the user's response to a list of acceptable responses.

Exams are not used as a GO/NO GO, or gate, between lessons but merely as a suggestion for student progression. Failure on a lesson exam (not meeting the 80% threshold) does not prevent the student from proceeding to another lesson. On the lesson exams, the user is provided specific feedback for each question through the correct response and additional information to anchor the learning objective.

On a pretest, the user is shown which questions were missed and told the lesson (within the subject) to which the missed question applies. Based on the areas missed, the user is shown the main menu with thumbs up/down to indicate which lessons should be re-examined before taking/retaking the final exam.

Similarly, upon completion of the final exam, the students are shown which lessons they did well on. Individual feedback (right/wrong and an explanation) is given for each question. Normally the correct answer for these questions is shown, although in some cases, the specific feedback indicates the correct answer. Additionally, feedback will refer the student to text/CBI for study to achieve the learning objective.

Look and Feel

The following standards reflect what is readily available within the Windows and the IconAuthor environment. Templates were created to make much of the navigation and functionality more uniform across lessons, subjects and courses and enhance the time required to produce the CBI.

Colors. Menus and opening screens have a dark gray or blue background with silver buttons. Individual screens within lessons, introductions, exercises, etc., use a variety of colors to enhance interest, readability, and maintain student attention.

Text is in a variety of colors. Menus and opening screens use black, white, silver, navy, and maroon (for emphasis). Other screens use colors that provide good contrast to the background. Use of florescent colors has, normally, been avoided because these often appear to pulsate on a bright screen and can thus be annoying.

Fonts. Arial is used for most text; 12 point and 14 point are preferred for normal text, with larger sizes for titles. In some instances 10 point arial is used when there is inadequate space for a larger font. Buttons are in a standardized font across the entire system (all courses, subjects, and lessons) as they are based on templates designed for the entire system.

Button Placement. Navigational buttons at the bottom of the screen are consistent throughout all the courseware. For PEs, buttons are placed in the logical location to aid student learning.

Borders. Screens do not have borders on them. This enabled us to make full use of the space available. Many screens will have a small text field or icon in the upper left corner as an indicator of the subject to aid the student in navigation.

Screen Layout. Menus contain no more than eight menu buttons, with screen navigation buttons at the bottom. They are generally 240 by 40 pixels, larger if needed.

Menu buttons generally correspond to lessons or topics. Normally the user will progress through the lessons/topics in the sequence designed by the SME and as shown (top to bottom). Figure D-3 provides the standard template for a subject main menu. To aid the user in navigation, the main menu is titled with the course and subject, designated in Figure D-3 as @ course and @ subject.

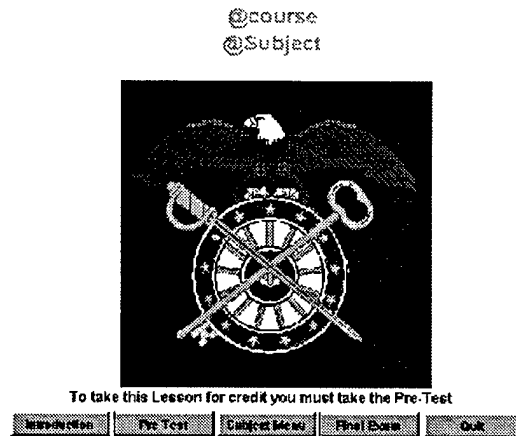


Figure D-3. Sample main subject menu

Submenus are used to allow the user access to individual items within a lesson. These include, at a minimum, the lesson introduction and lesson exam. In some instances, they provide access to topic material and/or practical exercises. In either case, the same "look and feel" standards mentioned above apply. The submenu contains the name of the course and lesson instead of the subject and lesson.

Other than menus, most other material is shown on a screen such as Figure D-4 which shows a student who has passed the lesson exam. Buttons are 40x160 (**Options** and **Replay**) and 40x120 (**Next >>** and **<< Previous**). Not all buttons are available all the time. Those not available are grayed.

The **Next >>** button is used for page turning when needed. Not all screens require the user to press **Next >>** to get to the following screen, but any screen with substantial amounts of text or diagrams allows the user to choose when to proceed.

The **<< Previous** button is the reverse of **Next >>**.

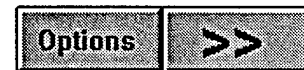
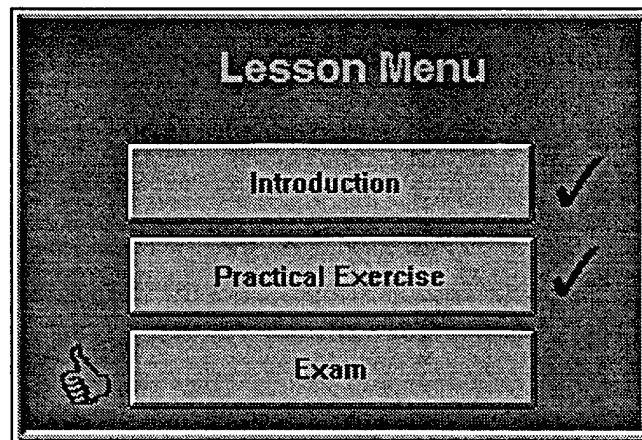


Figure D-4. Sample lesson menu.

The result of "**<< Previous**" is not necessarily "the previous screen". For example, one may show a diagram with audio, followed immediately by a text screen referring to the diagram. The text screen contains the **Next >>** button, which sends the user to a third screen. The "**<< Previous**" button on the third screen might more naturally send the user back to the diagram rather than the text.

The **Replay** button, when used, is more immediate. It is used to replay an audio or an animation. Again, **Replay** may cause the user to replay several screens.

The **Options** button is a catch-all. It produces a sub-menu of options. These normally include **Quit**, **Menu**, **Cancel**, **Glossary**, and a **Pose a Question** function. A **Cancel** button removes the options from the screen. Figure D-5 provides a sample of what these **OPTIONS** look like. Again, not all of these are available all the time, although the **Glossary** and **Pose a Question** functions are available most of the time. The **Menu** function returns the user

to the menu on which the current item (exam, lesson, topic, exercise, etc.) resides. Other standards for glossaries, etc., are discussed below. Other accessories under **OPTIONS** include **Credit?**, **Map**, and **Your Opinion**. The **Glossary** and **Pose a Question** functions are not available during exams or the pre-test or final exams.



Figure D-5. Sample options menu

In the case of a multiple choice question, 50 by 50 pixel buttons, labeled A-E are used. If the question has fewer than five possible answers, unneeded buttons are not shown.

For most questions, the **Next >>** button is used by the user to register a response, thus allowing the student to change the answer before it is recorded and/or checked in to the data base.

Functions

Navigation. Initially, the user is shown the screen in Figure D-3. If the student has never taken the pretest for this subject, the pretest button is available (ungrayed) and the final exam button is unavailable (grayed). If the pretest has been taken previously, the pretest button is grayed and the final exam button is ungrayed. In either case, the student may look at the introduction or go to the main menu. If the main menu is chosen, the student is asked if he wants to take the subject for credit.

Whenever a student exits the CBI, a "bookmark" is placed within the local database and eventually the host/Armory database. The next time the student returns to this subject, the main menu will look the way it did prior to exit.

The lesson menu will indicate with a thumbs up whether or not the lesson has been passed through the lesson exam, the pretest, or the final exam. If the lesson has not yet been passed, the item on the menu last viewed by this user is italicized. Figure D-4 gives an example of this. Once the user has taken the final exam at least once, the main menu will indicate (via thumbs up) which lessons were passed on the final.

Glossaries and accessories. Each course has a glossary designed by the SMEs to aid learning. The glossary is available through the **Options** button. The **Glossary** itself is a Windows Help File, and as such has hot spots and keyword searches available. The first page of a glossary is shown in Figure D-6. The user may return to the last screen he was on by using the **Previous** button.

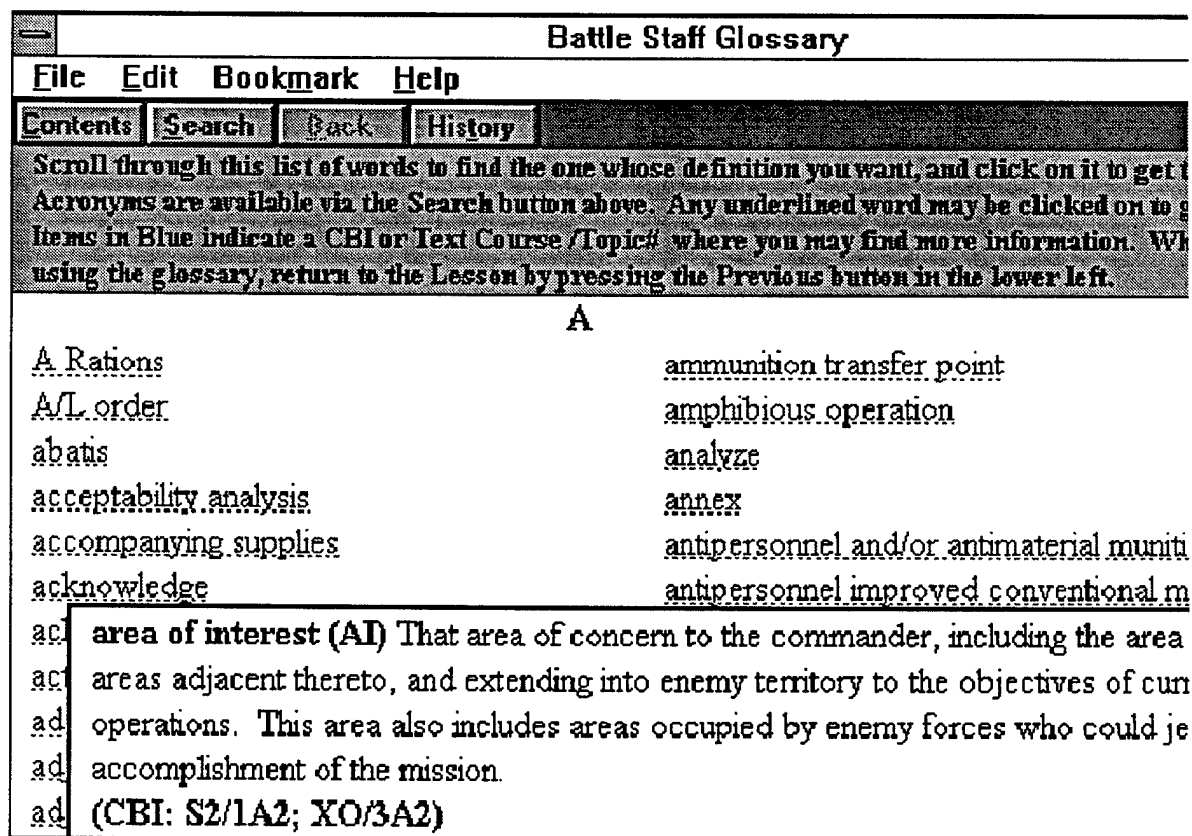


Figure D-6. Battle Staff Glossary

Other accessories include a **Course Map** and the **Pose a Question** function on the **Options** key. These are discussed below and in the section on management.

The student is allowed to type in a question for the trainer/mentor by the **Pose a Question** function in the **Options**. The question, plus some information about where in the subject the student was when the question was asked, are written to a file. This file is automatically sent to the host computer (armory) system when the student uploads results. (See support systems, below.)

Management

Data Collected from Training Sessions. Every exam within a lesson has a number. This number along with the type of exam (lesson, pretest or final exam) is recorded in the database, as are all the user's responses to computer-graded questions. Thus, for example EMMii has access to what answer (A-E) the student gave to question Number 3 on Exam 2. If the student takes an exam more than once, each iteration is kept as a separate record.

The start/stop date/times for each student session and the student's bookmark are recorded in the database. Other data are also maintained:

- Names and social security numbers.
- Current progress in courseware.
- Courses being used.
- Course (s) curriculum.

Data Format. Attached are sample screens and reports from the EMMii database. These provide an idea of the type of data available. Additional data are available in the EMMii user's guide.

The EMMii does allow the database administrator to establish roles that control access for users. These roles then determine which screens, functions and reports that a user may access.

Control over Progression. Originally, it was expected that the EMMii would control the student's progression through the courseware by disallowing access to a subject if its prerequisites had not been passed, but in its current form a student can access any subject or lesson for which he is scheduled in any order. The student will be told which subject(s) have been accessed and/or passed.

What distinguishes a course from a subject from the user's viewpoint will be the fact that within subjects there are menus and screens that allow him to allow navigation between lessons and topics, whereas going from one subject to another will generally involve an exit from the specific courseware to the EMMii student environment.

The standards discussed in this document (size, content, and structure) are for a Subject. Within a course, the student progresses from subject to subject. Within a subject, he goes from lesson to lesson.

The user is registered at the host computer (armory) for a course or courses and is provided with a schedule disk; CD ROM(s) containing the courseware; the student guide containing the text, curriculum, job aids, maps, operations order, instructions for assembling the computer, etc.; and a student computer. The student then can take the computer home and study at his own pace and sequence, and become a proficient battle staff officer.

Support Systems. Outside the courseware is the EMMii student environment. The user has several functions available here, as shown in Figure D-7.

The user is able to connect to the host computer via a (Shiva) net modem located at the armory end and appropriate modem software at the student's machine. The connection is performed easily via the EMMii Student Station software. Once connected, the student has the use any of the network functions: results upload, E-mail, and chat. Results upload sends data from the student's local database to the host database at the armory for review by the trainer. Any questions which were posed are also sent to the host database. The E-mail facility is the standard one provided with Windows for Workgroups (WFW). It allows the user to send mail to other users and to receive mail. The chat facility is also via WFW. It allows users on the network to converse with each other in real time through text messages.

The user is also able to find out where in the course progression he stands (lesson summary) and what he should take next. This is available through the EMMii student environment, not the courseware.

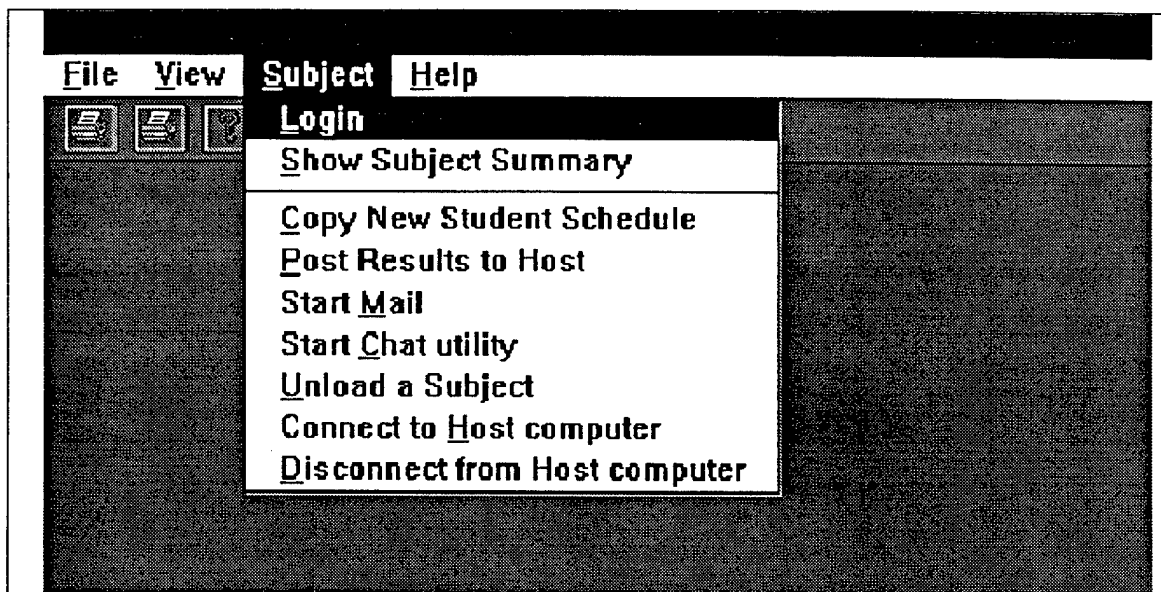


Figure D-7. Student functions available in EMMii

Reports. Attached as Figures D-8 thru D-17 are examples of standard EMMii reports. These indicate the type of data available to the trainer.

Guides. Each course contains a student guide that includes the course text, syllabus, course map, list of lessons, list of topics, all training objectives, a comprehensive list of references, instructions for assembling the computer, and instructions in case the computer doesn't respond as expected. Additionally, the brigade operations order, student handouts, job aids for the smart book, and maps or templates required to complete a course are included in the guide. The student guide refers the student to existing doctrinal publications but does not create new, or modified, doctrinal publications. One of the key goals of the courses of instruction is to enable the student to become proficient in the knowledge in the doctrinal publications and learn to quickly refer to the publications in a field environment.

There is a BSTS instructor guide for use by the mentor, instructor, or trainer. The instructor guide includes all key information in the student guides and the references for each

topic to guide the student in remediation. Additionally, instructions on how to operate in the EMMii environment (scheduling a student, monitoring a student's progress, reports, etc.) are included in the guide.

Delivery Mechanisms. The CD courseware will be delivered via 486 PCs equipped with a 16-bit sound card and speakers. Specifications for hardware and software are at Appendix B.

Security. Security at the student level was deemed unnecessary except when the student exits, to ensure data is captured for the database. While it isn't easy for a student to modify his answers before they go to the database, it is not impossible.

As mentioned earlier, the EMMii allows a wide range of variation in access to data among users. While designed for LAN and WAN configuration, the system was modified, at the request of ARPA, for stand-alone computer operation. The stand-alone mode was fielded to the two test brigades and a train-the-trainer (T3) course for unit system administrators. Security procedures were adapted for unit use and trained during the T3 workshops.

Form Edit Records Help

Students

Save Cancel

Id: 274804089

Last Name: Kasprzyk

First Name: Jennifer

Middle Initial: D

Position: Admin Coordinator

Department: TS. 214

Location: Ft Benning

Phone: 706-545-3734

Figure D-8. Student data screen.

Form Edit Records Help

Courses

Add Edit Delete Save Cancel

Name	Course	Archived?	CD Label
Common Core	CC	No	Common Core CD
Narrative: A common set of material to be mastered by all ARNG Battle Staff.			
S2	S2	No	S2 CD
Narrative: The ARNG S2 Course. Contains a Course Intro and 7 Subjects, IPB through BN HQ Coordination			
Narrative:			

Figure D-9. Screen for adding/editing course information.

Form Edit Records Help

Lessons

CC - 0: Intro to CC v.001

Course Name: Common Core Course: CC

Subject Name: Intro to Common Core Subject: 0 Order: 001

Lesson Name: Intro to Common Core Lesson: Intro to CC Order: 000 Version: 001

Directory: 10

Description: Contains a short introduction to what the CC Course consists of.

Narrative:

Duration: 00:10 (HH-MM) Mode: C Size: 001 in Megabytes

Approved? No Archived? No

Figure D-10. Screen for adding/editing lessons.

Form Edit Records Help

Schedule a Course using CD(s)

André, Charles R.

Id-Course: 00333373-CC

Student Name: André, Charles R.

Course Name: Common Core

Using disk
to schedule
the course
lessons

Figure D-11. Screen for scheduling a student for an entire course on CD ROM.

Form Edit Records Help

Student Schedule

Id: 0585441009 Name: Frese Sherry D

Start: 2/17/95 7:02:00 PM	End: 2/17/95 7:02:00 PM	By: chuck Type: C Done? <input type="checkbox"/>	Common Core	CC
			Battle Staff Integration	7
			Battle Staff Integration	Btl Str Intg 001
			CD ROM scheduled lesson	CDROM
Start: 2/17/95 7:02:00 PM	End: 2/17/95 7:02:00 PM	By: chuck Type: C Done? <input type="checkbox"/>	Common Core	CC
			Military Briefings	6
			Military Briefings	Mil Brifngs 001
			CD ROM scheduled lesson	CDROM
Start: 2/17/95 7:02:00 PM	End: 2/17/95 7:02:00 PM	By: chuck Type: C Done? <input type="checkbox"/>	Common Core	CC
			Terms & Graphics	5
			Terms & Graphics	Terms&Grph 001
			CD ROM scheduled lesson	CDROM
Start: 2/17/95 7:02:00 PM			Common Core	CC

Figure D-12. Viewing a student's schedule.

Form Edit Records Help

Student History

Andre, Charles R.

Id: 203888927 Andre Charles R

Course: S2 S2

Subject: IPB 1 Order: 001

DATE	TIME	STATUS	SCORE	REMARKS	APPROVED

Figure D-13. Viewing a student's status in a lesson.

Form Edit Records Help

Lesson History

Lesson: S2-1: IPB v.001

Course: S2 S2

Subject: IPB 1 Order: 001

Lesson: Intelligence Preparation of the Battlefield IPB Order: 001 Version: 001

Version	Date	Order	Subject	Lesson	Version
001	2/1/95	001	IPB	Intelligence Preparation of the Battlefield	001
002	2/1/95	002	IPB	Intelligence Preparation of the Battlefield	002
003	2/1/95	003	IPB	Intelligence Preparation of the Battlefield	003
004	2/1/95	004	IPB	Intelligence Preparation of the Battlefield	004
005	2/1/95	005	IPB	Intelligence Preparation of the Battlefield	005
006	2/1/95	006	IPB	Intelligence Preparation of the Battlefield	006
007	2/1/95	007	IPB	Intelligence Preparation of the Battlefield	007
008	2/1/95	008	IPB	Intelligence Preparation of the Battlefield	008
009	2/1/95	009	IPB	Intelligence Preparation of the Battlefield	009
010	2/1/95	010	IPB	Intelligence Preparation of the Battlefield	010

Figure D-14. Viewing the history of a lesson.

Form Edit Records Help

Student Answers

Student: Andre, Charles R.

Id: 003889372 Charles R Andre

Course: S2 S2

Subject: IPB 1 Order: 001

Lesson: Intelligence Preparation of the Battlefield IPB Order: 001 Version: 001

Exam Type: P Number: 0001 Taken: 2/1/95 12:45:13 PM

Score: 1 Threshold: 20 Grade: Fail

Question	Answer	Grade
1	Intelligence Preparation of the Battlefield	1
2	Intelligence Preparation of the Battlefield	1
3	Intelligence Preparation of the Battlefield	1
4	Intelligence Preparation of the Battlefield	1
5	Intelligence Preparation of the Battlefield	1
6	Intelligence Preparation of the Battlefield	1
7	Intelligence Preparation of the Battlefield	1
8	Intelligence Preparation of the Battlefield	1
9	Intelligence Preparation of the Battlefield	1
10	Intelligence Preparation of the Battlefield	1

Figure D -15. Viewing student exam answers.

Appendix E

BETA Testing Summary

This appendix provides a summary of the BETA testing conducted on each course of instruction in the BDE-BSTS. The more detailed data that were collected and analyzed during the conduct of testing are available elsewhere. In addition to the data presented in this appendix, data collected for each course included: specific target population and demographics; post course and lesson comments in the categories of text, doctrine, computer based instruction (CBI), and tests; test scores by lesson; subject and lesson summary; recommended actions to revise the course; and actions taken to revise the course before final production.

The general target population description included student officers that were AC or RC officers awaiting follow-on assignment having completed the Infantry Officer Advanced Course (IOAC). The officers had BS degrees having served as company commanders, executive officers, rifle platoon leaders, in both light and heavy forces. The average number of CTC rotations was 1.5, with an even split between both NTC and JRTC. Officers had little (.5 years) to no battle staff experience. Average age was 31.5 years, average time on active duty was 5.5 years with average reserve duty time 2 years. General comments from all officers were negative on use of traditional correspondence courses, highly positive to small group instruction, and negative to the overall quality of Army doctrinal publications. Overall computer literacy was low.

[NOTE: All times and scores, from this point on, are averages from the population sample]

Instructional results for each course are contained in the following tables:

Table E1. Common Core

PRE/POST TEST COMPARISON N=4				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1. Brigade Battlefield	75.5%	89.5%	19.0%	YES
2. Tactical Fundamentals	68.0%	80.0%	18.0%	YES
3. Staff Functions	76.0%	93.5%	23.0%	YES

Common Core course length summary.

Time to Complete: TEXT: 13.9
DOCTRINE: 1.75
CBI: 12.24
TOTAL TIME: 27.89 hours

Table E2. Executive Officer.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	%IMPROVEMENT	STANDARD MET?
1.Chief of Staff	68.00%	90.00%	33.00%	YES
2.Second in Command	70.00%	88.33%	26.19%	YES
3.Senior Logistician	61.00%	91.00%	49.18%	YES

Executive Officer course length summary.

Time to Complete: TEXT: 13.28
DOCTRINE: 12.42
CBI: 3.30
TOTAL TIME: 29.00 hours

Table E3. S1/Chaplain

PRE/POST TEST COMPARISON N=4				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1.Organization & Planning	75.00%	100.00%	34.23%	YES
2.Manning	63.00%	91.00%	44.44%	YES
3.Sustaining	80.25%	97.75%	21.81%	YES

S1/Chaplain course length summary.

Time to Complete: TEXT: 5.40
 DOCTRINE: 1.46
 CBI: 3.89
 TOTAL TIME: 10.75 hours

Table E4. S-2.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1.S2 Organization & Mission	56.0%	89.3%	59.5%	YES
2. IPB	35.0%	90.0%	157.0%	YES
3.Intelligence Annex	53.3%	94.0%	76.4%	YES
4.Analysis & Dissemination	60.3%	92.0%	52.6%	YES

S2 course length summary.

Time to Complete: TEXT: 6.60
 DOCTRINE: 8.28
 CBI: 9.84
 TOTAL TIME: 24.70 hours

Table E5. S-3.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1. Synchroniza- tion	67.7%	89.0%	31.4%	YES
2. Combat Spt	77.3%	91.7%	18.6%	YES
3. Supervise Execution	68.3%	90.0%	31.7%	YES

S-3 course length summary.

Time to Complete: TEXT: 8.87
DOCTRINE: 21.42
CBI: 8.01
TOTAL TIME: 38.30 hours

Table E6. S-3 Air.

PRE/POST TEST COMPARISON N=2				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1. S3 Air Duties & A2C2	63.5%	100.0%	57.5%	YES
2. Air Systems	62.5%	97.5%	56.0%	YES
3. Airspace Management	42.5%	91.0%	114.1%	YES
4. Air Ground Operations	65.5%	91.0%	38.9%	YES

S-3 Air course length summary.

Time to Complete: TEXT: 8.23
DOCTRINE: 13.01
CBI: 8.31
TOTAL TIME: 29.55 hours

Table E7. S-4.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1. Org Tact Sustainment	60.3%	92.0%	52.6%	YES
2.Tact Sustain Ops	55.0%	89.7%	63.0%	YES
3. Tact Sustainment Planning	69.7%	88.3%	26.7%	YES

S-4 course length summary.

Time to Complete: TEXT: 9.21
DOCTRINE: 10.30
CBI: 2.90
TOTAL TIME: 22.41 hours

Table E8. S-5.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	%IMPROVEMENT	STANDARD MET?
1.Civil Affair Ops	60.00%	86.00%	44.13%	YES
2.The Brigade S5	67.33%	86.67%	28.71%	YES

S-5 course length summary.

Time to Complete: TEXT: 6.55
DOCTRINE: 4.42
CBI: 3.13
TOTAL TIME: 14.10 hours

Table E9. Fire Support Officer.

PRE/POST TEST COMPARISON N=4				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1.Organization & Functions	67.4%	91.8%	36.0%	YES
2.Fire Support Planning	72.3%	88.5%	22.0%	YES
3.Fire Support Assets	64.0%	95.0%	45.0%	YES
4.Combat Operations	54.0%	93.3%	73.0%	YES

Fire Support Officer course length summary.

Time to Complete: TEXT: 22.80
 DOCTRINE: 20.80
 CBI: 5.94
 TOTAL TIME: 49.50 hours

Table E10. Engineer.

PRE/POST TEST COMPARISON N=4				
SUBJECT:	PRETEST	FINAL EXAM	%IMPROVEMENT	STANDARD MET?
1.Org and Function	64.50%	95.25%	47.70%	YES
2.Engr Planning	78.50%	96.25%	22.60%	YES
3.Engr Assets	68.50%	96.25%	40.50%	YES
4.Engr Opns	74.00%	97.00%	31.00%	YES

Engineer course length summary.

Time to Complete: TEXT: 11.40
 DOCTRINE: 9.97
 CBI: 2.10
 TOTAL TIME: 23.47 hours

Table E11. Air Defense Coordinator.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	%IMPROVEMENT	STANDARD MET?
1.Air Def Planning	64.00%	92.00%	45.03%	YES
2.Air Def Cmd & Ctrl	73.33%	96.67%	31.82%	YES
3.ID Friend or Foe	54.67%	98.33%	79.88%	YES

Air Defense Coordinator course length summary.

Time to Complete: TEXT: 5.50
DOCTRINE: 7.89
CBI: 8.50
TOTAL TIME: 21.89 hours

Table E12. Signal Officer.

PRE/POST TEST COMPARISON N=3				
SUBJECT:	PRETEST	FINAL EXAM	%IMPROVEMENT	STANDARD MET?
1.Signal Support	60.00%	86.00%	44.13%	YES
2.Signal Equipment	67.33%	86.67%	28.71%	YES

Signal Officer course length summary.

Time to Complete: TEXT: 2.47
DOCTRINE: 1.04
CBI: 4.41
TOTAL TIME: 7.92 hours

Table E13. Chemical Officer.

PRE/POST TEST COMPARISON N=4				
SUBJECT:	PRETEST	FINAL EXAM	% IMPROVEMENT	STANDARD MET?
1. Org & Duties	61.25%	91.75%	50%	YES
2. NBC Operations	62.0%	92.0%	48%	YES
3. US & Threat Equipment	44.5%	87.25%	96%	YES

Chemical course length summary.

Time to Complete:	TEXT:	15.40
	DOCTRINE:	9.18
	CBI:	4.22
	TOTAL TIME:	28.86 hours